

REMARKS/ARGUMENTS

Applicant has received and reviewed the Office Action of the Examiner mailed June 28, 2006. Claims 1-36 and 42-49 are pending, with claim 49 being newly presented. Favorable reconsideration is respectfully requested in light of the above amendments and the following remarks. No new matter has been added, as these claims are fully supported by the originally filed specification and drawings.

The Examiner has objected to claim 17 for antecedent basis. Claim 17 has been amended to correctly depend from claim 16, thereby resolving the issue. Favorable reconsideration is respectfully requested.

Rejection under 35 U.S.C. §103(a)

Applicant respectfully traverses the Examiner's rejection of claims 1-35 and 42-48 under 35 U.S.C. §103(a) as unpatentable over Zavracky et al., U.S. Patent No. 6,147,756, in view of Woodberry, U.S. Patent No. 4,956,555.

Turning first to independent claim 1, which recites:

1. (Currently Amended) A spectrometer, comprising:
a substrate;
a first spectrometer secured relative to the substrate, the first spectrometer comprising a first tunable optical filter and a first detector, the first tunable optical filter and the first detector adapted to detect a first tunable range of wavelengths;
and
a second spectrometer secured relative to the substrate, the second spectrometer comprising a second tunable optical filter and a second detector, the second tunable optical filter and the second detector adapted to detect a second tunable range of wavelengths, wherein the first tunable range of wavelengths is different from the second tunable range of wavelengths.

The Examiner acknowledges that Zavracky et al. does not disclose that the first tunable optical filter and the first detector are adapted to detect a first tunable range of wavelengths, and the second tunable optical filter and the second detector are adapted to detect a second tunable range of wavelengths. However, the Examiner states that Woodberry suggests providing an array of

spectral band pass filters onto detector arrays (citing column 1, lines 62-68), comprising a first multiplayer spectral filter 134 positioned in proximity of the first detector 102, a second multiplayer spectral filter positioned in proximity of the second detector 104, wherein the first detector detects radiation within a first band of wavelengths, and the second detector detects radiation within the second wavelength band (citing column 2, lines 9-36). The Examiner concludes that it would have been obvious to one skilled in the art at the time the invention was made to have the two adjacent microspectrometers of Zavracky et al. to be adapted to detect a first tunable range of wavelengths and a second tunable range of wavelengths, respectively, or in other words, have different spectrometers on the same substrate that can respond to different bands of wavelengths, in order to be able to sense/distinguish between more than one band of wavelengths by using only one array of spectrometers.

As the Examiner acknowledges, Zavracky et al. appear to teach providing an array of identical microspectrometers. The cited portion of Zavracky et al. states:

The small size and low unit cost of the microspectrometer makes array products practical. One implementation would utilize arrays of identical devices for pattern recognition, enhanced sensitivity and reliability-through-redundancy applications. Redundancy includes circuitry that places a second spectrometer element in the array on-line upon failure of another spectrometer element. The circuit can optionally identify failed components for the operator.

The microspectrometer design of the present invention is capable of producing spectrometers with a total area of $30\text{ }\mu\text{m} \times 30\text{ }\mu\text{m}$ and smaller. With such a small device, an array of spectrometers as shown in FIG. 6B which are similar to current photodiode arrays can be produced. This array can be used in a three dimensional mode in that it will not only provide two dimensional image information but will provide spectral information as well. Such arrays would be extremely useful for medical applications target, recognition in military applications and for environmental monitoring.

(Zavracky et al., column 8, lines 23-41). The microspectrometers of Zavracky et al. use cavity type interference filters. The Examiner states that, in view of Woodberry, it would have been obvious to somehow adapt the cavity type interference filters of Zavracky et al. such that two adjacent microspectrometers detect a first tunable range of wavelengths and a second tunable range of wavelengths, respectively. However, it is not clear how this might be accomplished,

and more particularly, it would not appear that one skilled in the art would have any expectation of success given the statements made by Woodberry, as further described below.

Woodberry appear to dispose a first multilayer thin film filter on a first subset of detectors in an array, and a second multilayer thin film filter on a second subset of detectors in the array. The multilayer thin film filters of Woodberry appear to be deposited or formed directly over the detectors. The multilayer thin film filters of Woodberry are clearly not "cavity type interference filters", as shown in Zavracky et al. Woodberry state:

Some applications for a multicolor focal plane require the selection of two narrow bands within a broader band of wavelengths. A metal-dielectric interference filter, such as the induced-transmission filter of Turner (See, e.g., Berning, et al., Induced Transmission in Absorbing Films Applied to Band Pass Filter Design, Journal of the Optical Society of America, Volume 47, Pages 230-239 (1957); Turner, Some Current Developments in Multilayer Optical Films, Journal de Physique et le Radium, Volume 11, Pages 443-460 (1950); Yeh, et al., U.S. Pat. No. 4,269,481) has been shown to be capable of providing such bandpass tuning by varying the thickness of only two layers within the filter structure. Although this result can also be achieved with a conventional cavity type of interference filter, attempts to shift the passband by altering only one or two of the layers in the latter design will result in severe degradation of the filter at long wavelengths. With the induced-transmission approach, it has been demonstrated that the passband can be shifted by changing the thickness of the two cavity layers bordering the metal film with no out-of-band performance degradation.

(Emphasis Added) (Woodberry, column 2, line 55 through column 3, line 8). As can be seen, Woodberry appear to teach away from applying their multicolor focal plane to conventional "cavity type of interference filters". As such, there would appear to be no motivation whatsoever to combine Zavracky et al. and Woodberry as the Examiner suggests. Moreover, one skilled in the art would not appear to have any expectation of success, given the specific statements made above by Woodberry with respect to "cavity type of interference filters". For these and other reasons, claim 1 is believed to be clearly patentable over Zavracky et al. in view of Woodberry. For similar and other reasons, dependent claims 2-18 are also believed to be clearly patentable over Zavracky et al. in view of Woodberry.

New claim 49 is dependent from claim 1 and further recites that the first detector is insensitive or substantially insensitive to the second tunable range of wavelengths and the second tunable optical filter blocks or substantially blocks transmission of the first tunable range of wavelengths. As a result, light that is within the second tunable range of wavelengths may not interfere with measurements of light within the first tunable range of wavelengths. Moreover, light that is within the first tunable range of wavelengths is absorbed or otherwise blocked or substantially blocked by the second tunable optical filter and thus may not impinge on the second detector. In some cases, this may provide an advantage of being able to simultaneously measure two distinct tunable ranges of wavelengths while preventing or at least substantially reducing cross-talk between the first and second detectors.

The cited references do not teach these and other elements. Zavracky et al. do not disclose or suggest that the first and second spectrometers are tuned to detect first and second tunable wavelength ranges. Moreover, Zavracky et al. does not teach that the first detector is insensitive or substantially insensitive to the second tunable range of wavelengths while the second tunable optical filter prevents or substantially prevents transmission of the first tunable range of wavelengths. The Examiner relies upon Woodberry to provide elements missing from Zavracky et al. Woodberry appears to disclose a first multilayer spectral film positioned proximate a first detector and a second multilayer spectral film positioned proximate a second detector. It is noted that Woodberry does not describe tunable filters and thus it is not certain that the teachings of Woodberry are even applicable to the claimed invention.

At any rate, although Woodberry describes multilayer spectral films that can be constructed to transmit at a particular wavelength, the reference does not appear to describe or suggest having a first detector that is insensitive or substantially insensitive to the second tunable range of wavelengths and a second tunable optical filter that prevents or substantially prevents transmission of the first tunable range of wavelengths. Therefore, claim 49 includes elements not shown by either reference. As a result, a *prima facie* obviousness rejection with respect to claim 49 is clearly not supportable.

Independent claim 19 (and hence claims 20-28 depending therefrom) includes elements

as follows:

19. A spectrometer, comprising:
 - a UV bandpass filter configured to selectively pass at least a range of ultraviolet light, the UV bandpass filter comprising a first plate and a second plate that are separated by a first separation gap, where the UV bandpass filter is selectively tunable by adjusting the first separation gap;
 - a UV light sensitive detector positioned downstream of the UV bandpass filter to receive light passed by the UV bandpass filter;
 - a visible bandpass filter configured to selectively pass at least a range of visible light, the visible bandpass filter comprising a third plate and a fourth plate that are separated by a second separation gap, where the visible bandpass filter is selectively tunable by adjusting the second separation gap; and
 - a visible light sensitive detector positioned downstream of the visible bandpass filter to receive light passed by the visible bandpass filter.

It can be seen that claim 19 expressly recites a UV sensitive spectrometer including a UV bandpass filter and a UV sensitive detector as well as a visible light spectrometer including a visible bandpass filter and a visible light sensitive detector. As admitted by the Examiner, Zavracky et al. do not disclose these elements. Instead, the primary reference appears to describe a visible light spectrometer that may extend somewhat into the infrared (not the ultraviolet as asserted by the Examiner). See, for example, column 6, lines 42-50 of Zavracky et al.

The Examiner is correct in noting that Woodberry may describe spectrometers arranged to detect radiation at two different wavelengths. However, there is no express disclosure within Woodberry that one wavelength should be within the visible portion of the spectrum while the other wavelength should be within the ultraviolet portion of the spectrum. Indeed, as noted above, Zavracky et al. leans toward the infrared, not the ultraviolet. Thus, any suggestion that these two references, in combination, suggest forming a spectrometer specifically having a UV sensitive spectrometer and a visible light sensitive spectrometer is nothing more than reconstructive hindsight. Therefore, claim 19 includes elements not shown by either reference. As a result, a *prima facie* obviousness rejection with respect to claims 19-28 is flawed and should be withdrawn.

Independent claim 29 (and hence claims 30-35 depending therefrom) includes elements

as follows:

29. (Original) A multiple wavelength spectrometer, comprising:
a plurality of first bandpass filters each configured to selectively pass at least a first range of wavelengths, each of the first bandpass filters comprising an upper plate and a lower plate that are separated by a first separation gap, where the first bandpass filters are selectively tunable by adjusting the first separation gap;
a plurality of first light detectors positioned downstream of the plurality of first bandpass filters to receive light passed by the first bandpass filters;
a plurality of second bandpass filters each configured to selectively pass at least a second range of wavelengths, wherein the first range of wavelengths is different from the second range of wavelengths, each of the second bandpass filters comprising an upper plate and a lower plate that are separated by a second separation gap, where the second bandpass filters are selectively tunable by adjusting the second separation gap; and
a plurality of second light detectors positioned downstream of the plurality of second bandpass filters to receive light passed by the second bandpass filters.

Claim 29 is believed to be clearly patentable over Zavracky et al. in view of Woodberry for similar reasons to those discussed above with respect to claim 1. For similar and other reasons, dependent claim 30-35 are also believed to be clearly patentable over Zavracky et al. in view of Woodberry.

Independent claim 42 (and hence claims 43-48 depending therefrom) includes elements as follows:

42. A spectrometer for detecting a first wavelength of light and a second wavelength of light, comprising:
a first spectrometer including a first detector downstream of a first optical filter, the first detector being sensitive to the first wavelength of light but not substantially sensitive to the second wavelength of light; and
a second spectrometer including a second detector downstream of a second optical filter, the second optical filter substantially absorbing the first wavelength of the light.

Claim 42 recites that the first detector is sensitive to a first wavelength of light but not substantially sensitive to a second wavelength of light, while the second optical filter

substantially absorbs the first wavelength of light. As discussed previously with respect to claim 49, claim 42 may provide an advantage of being able to simultaneously measure light of two different wavelengths while preventing or at least substantially reducing cross-talk between the first and second detectors. Thus, for the reasons given above with respect to claim 49, as well as other reasons, claim 42 is believed to be clearly patentable over Zavracky et al. in view of Woodberry.

Rejection under 35 U.S.C. §102(e)

Applicant respectfully traverses the Examiner's rejection of claim 36 under 35 U.S.C. §102(e) as anticipated by Kreimer et al., U.S. Patent No. 6,707,548. In order to anticipate, the cited reference must disclose each and every claimed element. Kreimer et al. fail to do so, particularly with respect to claim 36 as amended.

In particular, claim 36 has been amended as shown:

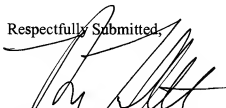
36. (Currently Amended) A method of detecting biological materials within a sample, comprising steps of:
subjecting the sample to an energy source to induce fluorescence in at least some of the biological material within the sample; and
simultaneously measuring at least some of the induced fluorescence using a UV light spectrometer comprising a Fabry-Perot filter tuned to pass UV light and a UV detector blind or substantially blind to visible light and a visible light spectrometer comprising a Fabry-Perot filter tuned to absorb UV light and a visible light detector.

Kreimer et al. do not appear to disclose using a UV light spectrometer that includes a Fabry-Perot filter that is tuned to pass UV light and a UV detector that is blind or substantially blind to visible light. Nor do Kreimer et al. appear to describe using a visible light spectrometer that includes a Fabry-Perot filter that is tuned to absorb UV light and a visible light detector. As the reference fails to describe each and every claimed element, Kreimer et al. cannot be considered as anticipatory. Favorable reconsideration is respectfully requested.

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In view of the amendments and comments presented herein, favorable reconsideration in the form of a Notice of Allowance is respectfully requested. If a telephone interview would be of assistance, please contact the undersigned attorney at 612-677-9050.

Respectfully Submitted,



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Brian N. Tufte, Reg. No. 38,638
CROMPTON, SEAGER & TUFTE, LLC
1221 Nicollet Avenue, Suite 800
Minneapolis, Minnesota 55403-2420
Telephone: 612-677-9050
Facsimile: (612) 359-9349